REMARKS/ARGUMENTS

Claims 1-15 are pending in the application. Claims 1-2 and 4 stand rejected under 35 U.S.C. § 102 as being anticipated in view of Bruns (Pat. No. DE 423 29 991 A1). Claims 3 and 5-15 stand rejected over Bruns and various other prior art. Reconsideration and allowance of claims 1-15 in view of the following remarks is respectfully requested.

The rejection of claims 1-2 and 4 under 35 U.S.C. § 102:

In response to the rejection of claims 1-2 and 4 under 35 U.S.C. § 102, Applicant disagrees with the Examiner's conclusion and traverses the rejection for the following reasons. For a prior art reference to anticipate under 35 U.S.C. § 102, each and every element of the claimed invention must be identically shown in the reference. Applicant's independent claim 1 recites "a compression chamber having a first 0° position . . . and an ignition chamber having a second 0° position . . . wherein the second 0° position is offset in relation to the first 0° position." The 0° positions of the compression and ignition chambers are defined as the position where the rotors contact the chamber walls (pg. 4, line 1 and lines 28-29). This limitation was previously called out by the Applicant in a prior amendment; however, the Examiner did not address this feature in the current 102 rejection. While the Examiner has remained silent on this point, Applicant can find no corresponding arrangement in Bruns. Further, as argued previously, the structural distinction of an "offset" between the chambers is functionally significant, as described in the specification at page 7, line 21 to page 8, line 6. In brief, the section details that the efficiency of the rotary engine can be improved

by the positioning of the combustion chamber 50 in relation to the compression chamber 34 about the rotational axis of the crank shaft 24. The Examiner has cited no art showing that such an arrangement is known to those skilled in the art, nor has the Examiner asserted personal knowledge that such an arrangement is well known. Accordingly, the Examiner has not met its prima facie burden, and independent claim 1 is not anticipated by or rendered obvious in view of Bruns.

Likewise, claims 2 and 4 are also novel and inventive in view of Bruns due at least to their dependence on independent claim 1.

The rejection of claims 3, 5-6, 7, 8, 9-13, 14, and 15 under 35 U.S.C. § 103:

Claims 3 and 5-15 stand as rejected under 35 U.S.C. § 103 over Bruns and various other prior art.

An obviousness analysis begins in the text of section 103 with the phrase "at the time the invention was made." For it is this phrase that guards against entry into the "tempting but forbidden zone of hindsight when analyzing the patentability of claims pursuant to that section. See Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 873, 228 U.S.P.Q. 90, 98 (Fed. Cir. 1985), overruled on other grounds by Nobelpharma AB v. Implant Innovations, Inc., 141 F.3d 1059, 46 U.S.P.Q.2d 1097 (Fed. Cir. 1998). Measuring a claimed invention against the standard established requires the often difficult but critical step of casting the mind back to the time of the invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and then-accepted wisdom in the field. See, e.g., W.L. Gore & Assoc., Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983). Close

adherence to this methodology is especially important in the case of less technologically complex inventions, where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against the teacher." Id.

The best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. See, e.g., C.R. Bard, Inc. v. M3 Sys., Inc., 157 F.3d 1340, 1352, 48 U.S.P.Q.2d 1225, 1232 (Fed. Cir. 1998) (describing "teaching or suggestion or motivation [to combine] as an essential evidentiary component of an obviousness holding") combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability - the essence of hindsight. See, e.g., Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1138, 277 U.S.P.Q. 543, 547 (Fed. Cir. 1985) ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.") In this case, the Examiner has fallen into the hindsight trap.

Evidence of a suggestion, teaching or motivation to combine may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem solved, although the suggestion more often comes from the teachings of the pertinent references. In re Rouffet, 149 F.3d 1350, 1355, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998). The range of sources available does not diminish the requirement for actual evidence. That showing must be clear and

particular. See, e.g., C.R. Bard, 157 F.3d at 1352. Broad conclusory statements regarding the teaching of multiple references, standing alone, are not evidence. McElmurry v. Arkansas Power & Light Co., 995 F.2d 1576, 1578, 27 U.S.P.Q.2d 1129, 1131 (Fed. Cir. 1993) ("Mere denials and conclusory statement, however, are not sufficient to establish a genuine issue of material fact.").

Regarding claims 3 and 5-8, these claims are novel and inventive over the prior art due at least to their dependence on independent claim 1, as argued above.

Regarding independent claim 9, the Examiner has objected to independent claim 9 under 35 U.S.C. § 103 as being obvious in view of Bruns in combination with Fanning (U.S. Pat. No. 2,359,903). The Examiner has asserted that while Bruns itself does not disclose each rotor having a slidable vane and the chamber having an epicycloidal shaped wall, the slidable vane and wall shape would be obvious to one of ordinary skill in the art in view of the teaching of Fanning.

Applicant cannot agree. First, the Examiner has failed to establish a prima facie case of obviousness because there is no suggestion or motivation, either in the references themselves or the knowledge generally available to one of ordinary skill in the art, to modify the references as suggested. Second, the Examiner has also failed to establish a prima facie case of obviousness since the prior art references do not teach or suggest all the claim limitations.

Specifically, Applicant's claim 9 requires that both the compression chamber and ignition chamber have an "epicycloidal-shaped chamber wall." This "epicycloidal-shaped chamber wall" is structurally different than the cited reference, and has functional significance. The claimed "epicycloidal-shaped

chamber walls" are shown in Applicant's Figs. 2, 5, 6, and 7 and are distinct from the "curvature, which is substantially of elliptic formation and symmetric about both the major and minor axis." See Fanning at column 2, lines 23-25. As seen in the attached Appendix of "Famous Curves Index" both the ellipse and epicycloid are listed as distinct "Famous Curves." Further, the mathematical equation describing the ellipse is not the same as the mathematical equation describing the epicycloid, as shown in the attached Appendix. Accordingly, these are not interchangeable shapes, and the teaching of Fanning of an elliptic formation does not render the present invention's limitation of "epicycloidal-shaped chamber walls" as obvious. Further, not only are these walls structurally different from Fanning, the structural difference has a functional advantage. Specifically, the amount of fuel compressed and combusted per pass in a rotary internal combustion engine is dependent in large part on the cavity between the rotors and the chamber wall. Further, the rate of compression and combustion is likewise affected by the sub-chambers formed between the chamber wall, the rotor, and the vane; thus, the chamber wall shape directly affects the performance of the engine. As the epicycloidal-shaped chamber walls are structurally distinct from the chamber walls of Fanning, and this structural distinction has a functional significance, Applicant asserts that independent claim 9 is not obvious in view of the proposed combination.

Additionally, dependent claims 10-15 are likewise not obvious in view of the proposed combination, due at least to their dependence on independent claim 9.

CONCLUSION

In view of the above amendments and remarks, Applicant believes claims 1-15 are in condition for allowance and Applicant respectfully requests allowance of such claims. If any issues remain that may be expeditiously addressed in a telephone interview, the Examiner is encouraged to telephone the undersigned at 515/558-0200.

Any fees or extensions of time believed to be due in connection with this amendment are enclosed herein; however, consider this a request for any extension inadvertently omitted, and charge any additional fees to Deposit Account No. 50-2098.

Respectfully submitted,

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Famous Curves Index

Click on the name of a curve below to see its history and some of its associated curves.

Anyone with the Mathematical MacTutor system can investigate these curves and their associated curves in an interactive way.

Similarly, anyone whose browser knows what to do with **Java** can experiment in the same way. Here is a list of those curves for which this facility is available

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Enter a word or phrase: [ ] Search Famous Curves

Main index
Definitions of Associated Curves
History Topics Index
Birthplace Maps
Mathematicians of the day
Anniversaries for the year
Timelines
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Societies,honours, etc
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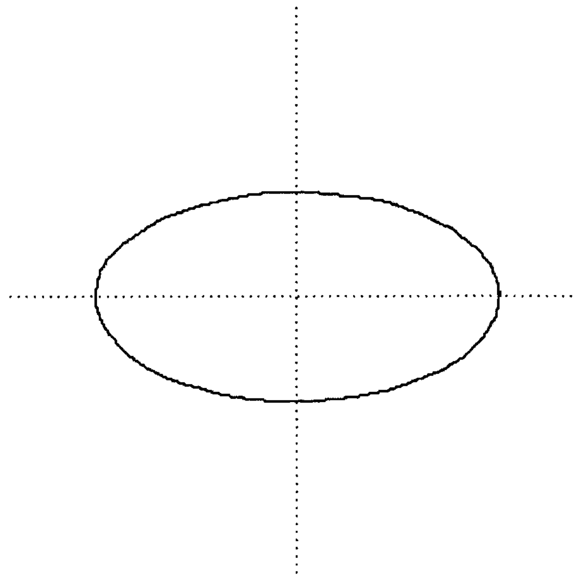
JOC/EFR November 2000

School_of_Mathematics_and_Statistics
University_of_St_Andrews,_Scotland

The URL of this page is:
http://www-history.mcs.st-andrews.ac.uk/history/Curves/Curves.html

Ellipse

Ellipse



Cartesian equation: $x^2/a^2 + y^2/b^2 = 1$

or parametrically: $x = a\cos(t)$, $y = b\sin(t)$

Click below to see one of the Associated curves.

Definitions of the Associated curves	Evolute
Involute 1	Involute 2
Inverse curve wrt origin	Inverse wrt another circle
Pedal curve wrt origin	Pedal wrt another point
Negative pedal curve wrt origin	Negative pedal wrt another point
Caustic wrt horizontal rays	Caustic curve wrt another point

If your browser can handle JAVA code, click HERE to experiment interactively with this curve and its associated curves.

The ellipse was first studied by Menaechmus. Euclid wrote about the ellipse and it was given its present name by Apollonius. The *focus* and *directrix* of an ellipse were considered by Pappus.

Kepler, in 1602, said he believed that the orbit of Mars was oval, then he later discovered that it was an ellipse with the sun at one focus. In fact Kepler introduced the word "focus" and published his discovery in 1609. The eccentricity of the planetary orbits is small (i.e. they are close to circles). The eccentricity

of Mars is $^1/_{11}$ and of the Earth is $^1/_{60}$.

In 1705 Halley showed that the comet, which is now called after him, moved in an elliptical orbit round the sun. The eccentricity of Halley's comet is 0.9675 so it is close to a parabola (eccentricity 1).

The area of the ellipse is πab. There is no exact formula for the length of an ellipse in elementary functions and this led to the study of elliptic functions. Ramanujan, in 1914, gave the approximate length

$$\pi(3(a + b) - \sqrt{[(a + 3b)(3a + b)]}).$$

The pedal curve of an ellipse, with its focus as pedal point, is a circle.

The evolute of the ellipse with equation given above is the Lamé curve.

$$(ax)^{2/3} + (by)^{2/3} = (a - b)^{2/3}.$$

From a point inside the evolute (it is a closed curve) four normals can be drawn to the ellipse but from a point outside only two normals can be drawn.

Other Web site:

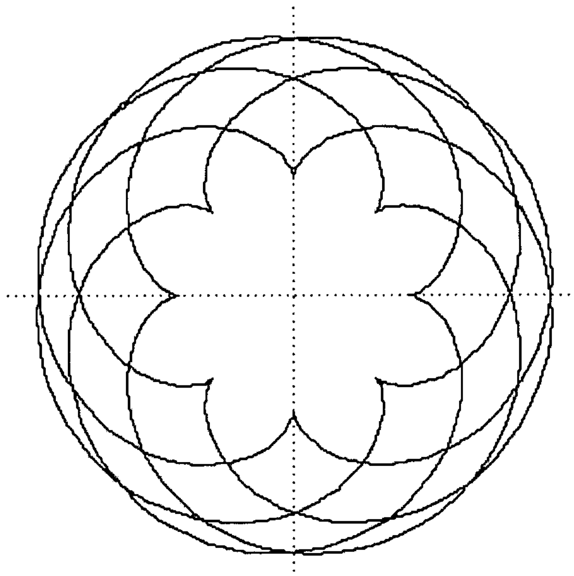
Xah Lee

JOC/EFR/BS January 1997

The URL of this page is:
http://www-history.mcs.st-andrews.ac.uk/history/Curves/Ellipse.html

Epicycloid

Epicycloid



Parametric Cartesian equation: $x = (a + b)\cos(t) - b\cos((a/b + 1)t)$, $y = (a + b)\sin(t) - b\sin((a/b + 1)t)$

Click below to see one of the Associated curves.

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If your browser can handle JAVA code, click HERE to experiment interactively with this curve and its associated curves.

There are four curves which are closely related. These are the epicycloid, the epitrochoid, the hypocycloid and the hypotrochoid and they are traced by a point P on a circle of radius b which rolls round a fixed circle of radius a.

For the epicycloid, an example of which is shown above, the circle of radius b rolls on the outside of the circle of radius a. The point P is on the circumference of the circle of radius b. For the example drawn here $a = 8$ and $b = 5$.

These curves were studied by Dürer (1525), Desargues (1640), Huygens (1679), Leibniz, Newton (1686), de L'Hôpital (1690), Jacob Bernoulli (1690), la Hire (1694), Johann Bernoulli (1695), Daniel Bernoulli (1725), Euler (1745, 1781).

Special cases are $a = b$ when a cardioid is obtained and $a = 2b$ when a nephroid is obtained.

If $a = (m - 1)b$ where m is an integer, then the length of the epicycloid is $8mb$ and its area is $\pi b^2(m^2 + m)$.

The pedal curve, when the pedal point is the centre, is a rhodonea curve.

The evolute of an epicycloid is a similar epicycloid - look at the evolute of the epicycloid above to see it is a similar epicycloid but smaller in size.

Other Web site:

Xah Lee

Main index	Famous curves index
Previous curve	Next curve
Biographical Index	Timelines
History Topics Index	Birthplace Maps
Mathematicians of the day	Anniversaries for the year
Societies, honours, etc	Search Form

JOC/EFR/BS January 1997

The URL of this page is:
http://www-history.mcs.st-andrews.ac.uk/history/Curves/Epicycloid.html